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LIQUID FUEL PUMPS FOR COMPRESSION IGNITION ENGINES

Filed June 2, 1960

2 Sheets-Sheet 1

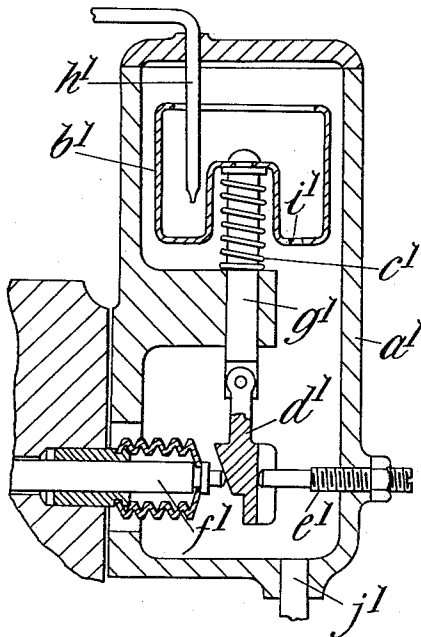


Fig. 1.

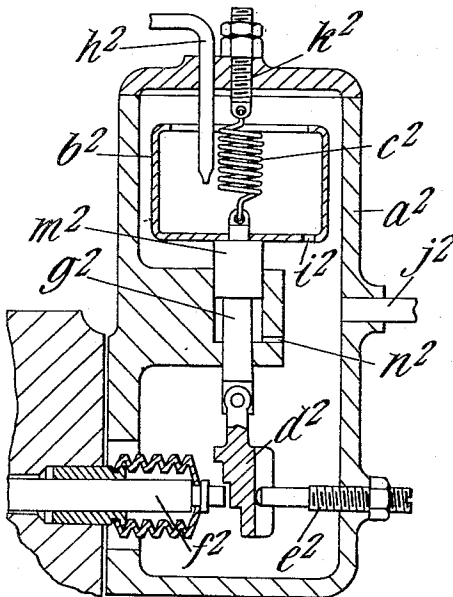


Fig. 2.

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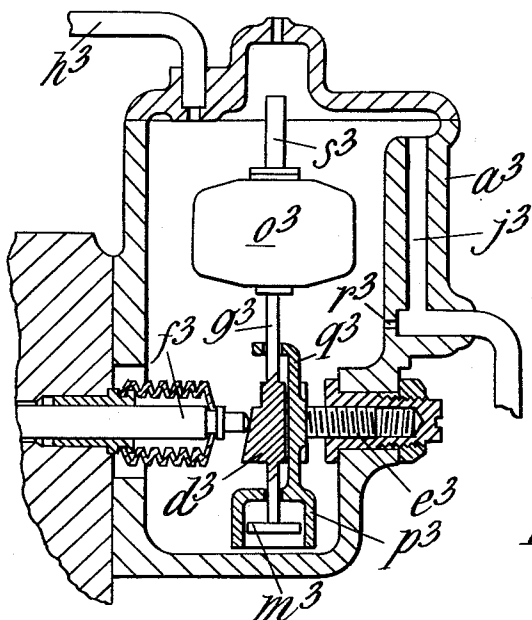


Fig. 3.

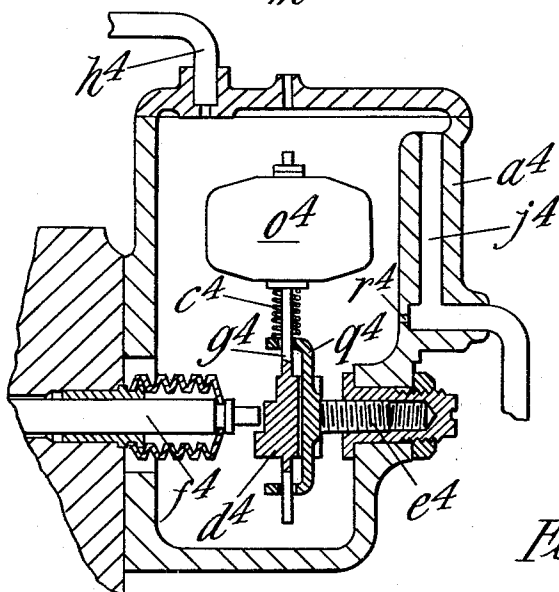


Fig. 4.

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9 Claims. (Cl. 123—139)

This invention relates to liquid fuel pumps for compression ignition engines, and of the kind having combined therewith a longitudinally movable regulating rod for determining the rate of delivery of the pump, and a stop for limiting movement of the rod in one direction so as to determine the maximum delivery rate of the pump.

In such pumps it is usual for the stop to be adjustable. However, in certain countries where normal fuel oil may not at all times be readily available it may be necessary for the engine to run on other fuels such, for example, as petrol or paraffin. A change from one type of fuel to another will necessitate a change in the position of the stop determining the maximum rate of delivery of the pump, and the object of the present invention is to provide convenient means for automatically varying the position of the stop to accord with the type of fuel being supplied to the pump.

According to the invention in a liquid fuel pump of the kind specified the stop comprises a piece of varying width movable laterally between an abutment and the end of the regulating rod, and means responsive to a change in the density of the fuel for moving the said piece.

In the accompanying drawings FIGURES 1, 2, 3 and 4 respectively illustrate in sectional side elevation four different examples of the invention. Moreover, in the four figures similar or analogous parts are designated by the same reference letter suffixed by the number of the figure.

Referring first to the example of the invention illustrated in FIGURE 1 there is provided a housing a^1 containing a cup b^1 which is vertically movable against the action of a spring c^1 . The cup is connected to a wedge piece of d^1 which is movable laterally between a relatively fixed but adjustable abutment e^1 and one end of a longitudinally movable regulating rod f^1 which serves to control the quantity of fuel delivered by the fuel pump. Movement of the regulating rod f^1 away from the wedge piece d^1 , that is, to the left in FIGURE 1, causes the quantity of fuel delivered by the pump to be decreased, and reverse movement of the regulating rod causes the quantity of fuel delivered by the pump to be increased, in known manner. The cup is connected to a rod g^1 which extends through a bore in an integral part of the housing a^1 and is pivotally connected at its lower end to the wedge piece.

Fuel can flow to the cup b^1 from any convenient part of the fuel supply system through an inlet pipe h^1 extending downwardly into the housing, and in the bottom of the cup is a small drain hole i^1 through which fuel can escape to the lower part of the housing which has a fuel outlet j^1 .

The lower and narrower end of the wedge piece d^1 is stepped to provide a shoulder at that side presented to the regulating rod f^1 , and the arrangement is such that when the cup b^1 is empty this shoulder is disposed above the rod f^1 which prevents downward movement of the cup and wedge piece whilst it bears against the latter. Moreover, in this position the regulating rod can assume a position wherein it sets the pump to supply fuel at a rate greater than the normal maximum rate, such condition being required for starting the engine.

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In operation, assuming that the engine is stopped, fuel drains from the cup to the lower end of the housing and thence from the outlet j^1 . As a result the wedge piece rises to a position in which its shoulder is above the regulating rod. When it is required to start the engine the regulating rod is moved against the wedge piece beneath the shoulder to give a rate of fuel supply greater than the normal maximum. When the engine starts the regulating rod will be moved away from the wedge piece by a governor or other means, and as a result the wedge piece will assume, between the regulating rod and the abutment e^1 a position which is dependent on the density of the fuel which has meanwhile filled the cup b^1 .

The example of the invention illustrated in FIGURE 2 differs from that illustrated in FIGURE 1 in the following respects:

Firstly, the piece d^2 has a plurality of steps defining a plurality of portions of different widths instead of being of wedge form. By this means, vertical forces on the cup b^2 as a result of the rod f^2 bearing against the piece is avoided, although the stop is not infinitely adjustable within the limits of the piece, as in the case of the example shown in FIGURE 1.

Secondly, the spring c^2 is a coiled tension spring interposed between the rod g^2 and an adjustable support k^2 at the upper end of the housing a^2 . By this means, the tension of the spring can be adjusted from the exterior of the housing as opposed to the example shown in FIGURE 1, where a coiled compression spring is interposed between the underside of the cup and the housing.

Thirdly, the bore in the part of the housing a^2 is in part shaped to form a cylinder occupied by a piston m^2 formed on the rod g^2 , the lower end of this cylinder having a restricted orifice n^2 through which it is in communication with the interior of the housing.

Lastly, the outlet j^2 of the housing is disposed at a level above the restricted orifice n^2 so that the lower end of the cylinder is maintained full of fuel, and in conjunction with the piston m^2 serves as a dashpot to damp the movements of the cup b^2 and piece d^2 .

In the example illustrated in FIGURE 3, the piece d^3 is again of wedge form, but is inverted relative to the wedge piece in FIGURE 1. Moreover, the piece d^3 is connected to a float o^3 in the upper portion of the housing a^3 and the outlet j^3 is disposed near the upper end of the housing. Furthermore, a piston m^3 connected to a rod g^3 formed integrally with the wedge piece, is disposed within a cylinder p^3 below the wedge piece to serve as a dashpot. The cylinder p^3 is formed as part of a guide member which also serves as part of the abutment q^3 .

The working of this example is similar to those illustrated in FIGURES 1 and 2, since the float assumes a position depending upon the density of the fuel, and thereby adjusts the position of the piece d^3 accordingly. Moreover, when the engine is stopped fuel can escape from the housing a^3 through a restricted orifice r^3 so that the piece d^3 assumes a position with its shoulder below the rod f^3 .

The example illustrated in FIGURE 4 differs from the example shown in FIGURE 3 only in that the piece d^4 is of stepped form, the dashpot is omitted, and a spring c^4 is interposed between the float and the guide q^4 . The float in this instance is intended to be totally submerged within the fuel when the engine is in operation, whereas in FIGURE 3 a stem s^3 was at all times disposed above the level of the fuel.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. For use in a fuel supply system of a compression ignition engine, a liquid fuel pump having in combination therewith a longitudinally movable regulating rod for

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determining the rate at which fuel is delivered by the pump, a stop of varying width for limiting movement of said rod in the direction for increasing the fuel delivery rate of the pump, an abutment between which and one end of said rod a part of said stop is disposed, and means movable in one direction from an initial position by fuel from the fuel supply system of the engine, and connected to said stop for moving the latter transversely in relation to said rod through distances dependent on the density of the fuel to bring different parts of said stop between said rod and said abutment.

2. A liquid fuel pump according to claim 1, wherein said stop occupies a position in which its narrowest portion is disposed between said rod and said abutment when said means occupies its initial position.

3. A liquid fuel pump according to claim 1, wherein said means comprises a spring-supported cup for receiving fuel from the fuel supply system of the engine, and a stem depending from said cup and connecting the latter to said stop.

4. A liquid fuel pump according to claim 1, wherein said means comprises a spring-supported cup for receiving fuel from the fuel supply system of the engine, and a stem depending from said cup and connecting the latter to said stop, said cup having in its lower end a small drain hole through which the fuel supplied to said cup can escape therefrom, so that said cup will be emptied automatically when the supply of fuel thereto is discontinued, and will rise to its uppermost position under the action of its supporting spring.

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5. A liquid fuel pump according to claim 1, and having in combination therewith a housing which contains said stop, said abutment, and said means, and into one side of which said rod extends, said abutment being carried by the opposite side of said housing, said means comprising a float, and said housing having a fuel inlet at its upper end, a fuel outlet near its upper end, and a restricted drain orifice at a lower level than said fuel outlet.

6. A liquid fuel pump according to claim 1, wherein said stop is provided adjacent the narrowest portion thereof with a step which serves by contact with the adjacent end portion of said rod to prevent movement of said stop by said means until said rod is moved away from said stop.

7. A liquid fuel pump according to claim 1, wherein said stop is wedge-shaped.

8. A liquid fuel pump according to claim 1, wherein said stop is provided at the side nearest to said rod with a plurality of steps which impart the varying width to said stop.

9. A liquid fuel pump according to claim 1, and having a dashpot operatively associated with said stop for damping the movements thereof.

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